PB-215 195

SEDIMENT PRODUCTION RATING CHEHALIS RIVER BASIN, WASHINGTON

Public Health Service
Portland, Oregon

19 June 1962

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

REGIONAL INFORMATION OFFICE

PB 215 195

WORKING PAPER NO. 24

Columbia River Basin Project
For Water Supply and Water Quality Management

SEDIMENT PRODUCTION RATING
CHEHALIS RIVER BASIN, WASHINGTON

June 19, 1962

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Public Health Service
Region IX

Division of Water Supply and Pollution Control
570 Pittock Block
Portland, Oregon

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

REGIONAL INFORMATION OFFICE

Return To:
Files

WORKING PAPER NO. 24

COLUMBIA RIVER BASIN PROJECT
For Water Supply and Water Quality Management

SEDIMENT PRODUCTION RATING
CHEHALIS RIVER BASIN, WASHINGTON

Date: June 19, 1962

Prepared by WEB

Reviewed by _____

Approved by _____

DISTRIBUTION

Project Staff_____

Cooperating Agencies_____

General_____

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Public Health Service
Region IX

Division of Water Supply and Pollution Control
570 Pittock Block
Portland 5, Oregon

I

This working paper contains preliminary data and information primarily intended for internal use by the Columbia River Basin Project staff and cooperating agencies. The material presented in this paper has not been fully evaluated and should not be considered as final.

SEDIMENT PRODUCTION RATING
CHEHALIS RIVER BASIN
WASHINGTON

INTRODUCTION

The sediment production rating is based on field inspection of representative portions of the Chehalis Basin to determine extent of the sediment problem, to locate sediment source areas, and to estimate total sediment movement within the basin.

SUMMARY AND CONCLUSIONS

The sediment production rating given the Chehalis River Basin is "low", indicating an average sediment yield between 50 and 150 parts per million of flow. Physical features of the watershed are favorable, despite some soils with a tendency to slump and slide. The forest cover comes back rapidly after the timber harvest, and erosion and sedimentation following logging do not last long. There are few or no problems on the cultivated lands. Bankcutting at high water stages occurs along some of the channels, but does not appear to be causing excessive sedimentation.

DESCRIPTION OF THE BASIN

The Chehalis River drains the southern end of the Olympic Mountains, the Cascade Mountain foothills south of Puget Sound, and the northeast part of the Willapa Hills in southwest Washington. It empties into the Pacific Ocean through Grays Harbor. The basin occupies western Lewis County and parts of Thurston and Mason and Pacific and Grays Harbor Counties, with a total area of about 2,000 square miles. Highest elevations in the basin are 3,100 feet on Boistfort Peak in the Willapa Hills; 3,800 feet in the Cascade foothills at the head of the Skookumchuck drainage; and 4,800 feet in the Olympic Mountains on Discovery Peak at the head of the Wynoochee drainage.

Geologic formations 1/ underlying the basin include recent alluvium along the main river and the major tributaries; basalts and breccias of Eocene to Miocene age interbedded with sandstones and conglomerates in the upper Wynoochee drainage and along Elk Creek and in the Willapa Hills and Cascade foothills; gravelly terrace deposits in the middle Wynoochee and Satsop drainages; quaternary glacial drift and till in the Black River and Scatter Creek drainages; nonmarine quaternary gravelly deposits in the Newaukum Valley and along the main Chehalis River; marine sandstones and siltstones of Miocene and Pliocene age in the lower Wynoochee area; and Eocene marine sedimentaries in the Willapa Hills and central parts of the basin. The

1/ Geologic Map of Washington, Washington Dep't. of Conservation.

sedimentary rocks are soft and readily weathered and subject to sliding and slumping.

Soils developed on these rock formations range from clay loams to shot loams in the mountains, from silty clay loams to peat and muck soils in the valleys. The forest soils are generally deep and permeable, moderately erodible when disturbed, and occasionally subject to slumping and sliding where subsoils are clayey.

Cover is predominantly Douglas-fir forest in the hills and mountains, with hardwood brush on nonrestocked old cutovers and burned areas. Lower hills on the forest fringe are used for pasture; here the forest has been changed to grass. The valleys are cultivated. Most of the forest has been cut over once.

Climate is humid, with long wet winters and short dry summers. Temperatures are moderated by the influence of the Pacific Ocean to the west. While some mountain areas, as in the upper Wynoochee drainage, receive upwards of 160 inches average annual precipitation, rainfall intensities rarely exceed an inch an hour. At elevations above 2,000 feet much of the precipitation comes as snow.

Streamflow follows the climatic pattern, high in winter and spring, low in summer. Major floods have occurred from November to March. January and February have the highest average flow in most streams, August the lowest.

With respect to erosion and sedimentation, the physiographic factors are generally favorable. While much of the topography is steep, the soils are stable, the cover vegetation dense, and the rainfall gentle. The densest forest covers the higher elevations with the greatest precipitation.

RELATED STUDIES BY OTHER AGENCIES

In 1959 the Washington Pollution Control Commission took sediment samples at two-month intervals at various stations along the Chehalis River and some of the major tributaries. Sediment loads [1] observed ranged from less than 20 ppm most of the season to nearly 200 ppm at one station after a December storm. Some of the loads over 100 ppm were noted as due to road construction.

The report of the Corps of Engineers on the Wynoochee River [2] indicates that 4 acres of arable land are lost each year by stream changes and bankcutting at times of high water.

1/ Unpublished data in files of the Washington Pollution Control Commission.

2/ Report on Survey of Wynoochee River, Washington, Corps of Engineers, December, 1961.

There are only small diversion dams on streams of the basin and no opportunity for complete settling and trapping of sediments.

SURVEY METHODS

Visual inspection was made of the major stream channels and of as much of the watershed area as could conveniently be reached by road. Channel conditions with respect to bankcutting, sedimentation, and aquatic habitat were observed and noted. Logged, burned, grazed, and farmed areas were inspected on different geology and topography to estimate relative sediment contributions. Effects of construction of an extensive system of mountain roads for the timber harvest were also noted.

Ratings of sediment production were made in five classes which may be broadly interpreted in terms of p.p.m. suspended sediment load in the average annual total water yield as follows:

Rating Class	Average Suspended Load, p.p.m.
Slight	Under 50
Low	50 to 150
Moderate	150 to 500
High	500 to 1500
Very High	1500 plus

The estimated ratings are subjective, based on comparing physical conditions of the Chehalis Basin with those of other basins previously surveyed.

SURVEY FINDINGS

The Skookumchuck and Newaukum tributaries draining from the Cascade Mountains foothills have stable watersheds with few slide or slump areas and not much sediment contribution from roads or logging. Channel beds are stable, populated with a variety of small aquatic fauna and flora, and appear to provide excellent aquatic habitat. Popularity of these streams with fishermen bears this out. Though visited shortly after a spring storm and therefore flowing at above average rates, these streams did not show appreciable turbidity in the upper reaches. Where they break out of the hills into the rolling to flat main valley, there was some bankcutting and the waters were somewhat turbid. In only one place, however, was there excessive bankcutting and downstream sediment deposition noted. Through the agricultural area there was occasional evidence of minor bankcutting, but it did not appear to be creating any serious problems. These two watersheds are rated "low".

The Black River and Scatter Creek tributaries on the northeast corner of the basin drain the Black Hills south of Olympia and the rolling glacial drift terrain north of Centralia. Erosion and sedimentation present no problems. While there has been erosion in the upper tributaries following logging and some bankcutting, the eroded material has not moved out of the tributaries.

Old beaver dams, stabilized by hardwood growth, have trapped it. The channel of Black River is on a very flat gradient and is choked with cattails and willows that serve to screen out floating debris and suspended sediment. These two watersheds are rated "slight"; however, because of its swampy nature, Black River is very dark with dissolved organic humic acids, etc.

The Satsop and Wynoochee and Wishkah Rivers drain the south side of the Olympic Mountains on the north end of the basin. Topography in the headwaters is rough, and the unstable sedimentary formations along the streams have produced many slips and slumps directly into the streams. In its lower reaches the Wynoochee cuts away its banks at nearly every high-water stage. Timber access road construction and artificial channel changes have put considerable debris in the Wynoochee. In the upper reaches, particularly along the channels, the Wynoochee and Satsop watersheds are rated "high". Sixteen Creek, tributary to the Wynoochee, showed heavy sediment movement as the result of road construction in an unstable slide area, and is rated "very high". In the gentler rolling topography of the middle and lower portions of their watersheds the Satsop and Wynoochee are rated "low", and "slight" on the glacial drift areas. The Wishkah Watershed was not visited, but is assumed to be similar to the lower Satsop and Wynoochee Watersheds. Since the average annual water yield of the three rivers well exceeds one million acre-feet, the high-flow bankcutting erosion losses along the lower reaches do not significantly bulk up the total stream sediment loads. The overall rating, therefore, is "low" to "moderate".

The small drainages south of the Chehalis River in its lower course drain relatively gentle and heavily forested topography underlain by sedimentary rocks. Though this area was not visited, it is assumed that it would have only insignificant erosion and sediment problems caused by an occasional slump and limited bankcutting in the lower stream courses. This area is assigned a "low" rating.

Bunker and Lincoln Creeks in the center of the basin also drain areas of gentle rolling to flat topography and show no erosion and sediment problems. These watersheds are rated "slight".

Elk Creek, the upper Chehalis River, and South Fork Chehalis River drain the very rough topography of the Willapa Hills on the southern end of the basin. Below the towns of Pe Ell and Boistfort the topography is relatively gentle and erosion and sediment problems are limited. These areas rate "slight" to "low". The higher and steeper areas still have some of the original forest cover and where undisturbed also are rated "slight" to "low". Extensive timber access road construction has put a lot of debris into stream channels, and in many places the road fills still erode directly into the channels. Some recently logged areas show considerable erosion in the skidtrails, and some of the minor tributaries below are choked with sediment. Though these areas - not extensive - would be rated "high", the sediments do not seem to move far downstream. Recovery of the logged areas is fairly rapid, excellent second-growth stands are developing on the slopes logged ten or twelve years ago. Channel bed conditions in the major tributaries are very good, with

plentiful aquatic life on the stones. In two or three places where the streams were turbid and the beds somewhat silted by current road construction, the condition did not carry very far downstream. Effects of road building and logging are apparently only temporary. This part of the basin is rated "low" to "moderate".

The main stem of the Chehalis River has a very flat gradient. Although it does some bankcutting at flood stages, it is not a heavy producer of sediment.

The Chehalis Basin over-all is rated "low" for sediment production.

Even before the beginning of summer, some of the tributaries are showing discoloration from dissolved organic matter. This was quite noticeable in the upper Chehalis River at Rainbow Falls. Below the falls in an eddy there was a small accumulation of suds piled up, caused perhaps by detergents from sewage disposal in the small towns and farms upstream, or possibly by the dissolved natural organic matter.

RECOMMENDATIONS FOR IMPROVEMENT

Cleanup of floating drift that jams up and causes channel changes and bankcutting, less use of tractors in logging on steep slopes and wet soils, and more care in timber access road location and construction would help greatly in reducing what erosion and sediment production now occurs.